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ABSTRACT

Research and development projects at the AT&T (American Telephone and Telegraph Company) National Teletraining Center (NTC) are geared toward increasing understanding of the various psychological, sociological, ergonomic, and environmental factors involved in teletraining, and toward improving the ability to manage the distance learning environment effectively. This paper presents a retrospective look at five years of learning from teletraining, with an emphasis on student learning outcomes and on what distance educators have learned about the design and management of teletraining systems. Included are: (1) a description of teletraining and research projects at the NTC; (2) a definition of teletraining; (3) a discussion of the instructional effectiveness of the medium, including reviews of studies on students' achievement outcomes, acceptance of teletraining, and expectations; (4) a cost-benefit analysis of the medium; (5) an outline of course and curriculum development activities of the NTC; (6) a list of instructor competencies required for teletraining; (7) descriptions of media attributes; and (8) system implementation guidelines. Future research directions are discussed. (27 references) (GL)

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AN OVERVIEW OF RESEARCH AND DEVELOPMENT PROJECTS AT THE AT&T NATIONAL TELETRAINING CENTER

by

Alan G. Chute

Lee B. Balthazar

AT&T NATIONAL TELETRAINING CENTER

CINCINNATI, OHIO

SEPTEMBER 1988

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INTRODUCTION

Programmatic Research Effort

1.00 This article presents a retrospective look at five years of learning from teletraining, specifically what the students have learned and what the distance educators have learned regarding the design and management of teletraining systems.

1.01 Research and development projects at the AT&T National Teletraining Center (NTC) are geared toward increasing understanding of the various psychological, sociological, ergonomic and environmental factors involved in teletraining and toward improving the ability to effectively manage the distance learning environment. The projects described in this article represent part of an overall programmatic research effort to optimize and proliferate specific teletraining technologies within the broader context of distance education.

1.02 Many of the findings and recommendations to be discussed have been implemented in the design, delivery, and management of AT&T courses. Those that are non-proprietary are shared with clients interested in the deployment of effective teletraining systems.

National Teletraining Center

2.00 Research and development is conducted at the National Teletraining Center located in Cincinnati, Ohio. The mission of the NTC is to investigate, develop and demonstrate innovative applications for state-of-the-art telecommunication technologies. The NTC is the AT&T Showcase for Information Movement and Management (IM&M) not only within the corporate business & training environment but within the traditional educational setting as well.

2.01 The NTC works closely with AT&T Bell Laboratories, leading universities, and nationally-recognized experts to research problems and develop creative solutions for every teletraining need.

Teletraining Defined

3.00 Teletraining is defined as a complete system that integrates the planning, delivery and management of training by using a combination of information technology and teleconferencing services. Three delivery media are used in teletraining; audio, audiographic, and video.

3.01 Audio: Audio (AU) teletraining uses conventional telephone lines that are networked together to provide an interactive, shared-audio space between instructor and students.

3.02 Audiographic: Audiographics (AG) provides users with the capability to interact with one another through two-way voice and graphic communication and to share images simultaneously on high-resolution, color monitors. The screen images can be annotated with the aid of graphics tablets which further enhances the participants' capability to interact spontaneously with one another.

3.03 Video: Video technology provides several modes of delivery. Broadband communication channels enable all locations to see live, full-motion video from the originating site. Newer technologies will enable 2-way visual and 2-way audio communication between all locations connected by hi-speed, hi-capacity digital lines.

3.04 Video together with audio and audiographic technology make up a continuum of delivery options that can provide either very basic (audio only) or very sophisticated (full-motion video) levels of presentation.

RESEARCH & DEVELOPMENT PROJECTS

4.00 A primary focus of research at the NTC has been to improve the effectiveness of state-of-the-art teletraining (TT) systems through research. The areas studied include: (1) instructional effectiveness (e.g. learning, acceptance, appeal, expectations, and attributions), (2) cost-benefit analyses (e.g. cost-avoidance, cost-comparisons, and cost-efficiency).

4.01 Additional studies have focused on (3) course and curriculum development (e.g. national surveys, identification of course and curriculum components, workshops, evaluation of support services), (4) media attributes and system implementation, and (5) directions for future research and development. These represent a sample of the types of problems the NTC investigates on an ongoing basis to advance their understanding of teletraining's potential.

INSTRUCTIONAL EFFECTIVENESS

Learning

5.00 The instructional effectiveness of TT was demonstrated by Chute, Bruning, and Hulick (1984), who compared several modes of delivery and their respective student achievement outcomes. Two intact groups of students were presented with either traditional, face-to-face (FF), classroom instruction or remote TT instruction. The TT mode utilized an electronic conference board, two-way voice communication, and interactive graphics capability. Transmissions over standard telephone lines linked instructors with their distant students. The course content and the amount of instruction were held identical for both groups.

5.01 Their results showed that while pretest scores between the two groups were not found to be significantly different ($t = 1.73$, $df = 20$), the posttest scores of the teletrained group were significantly higher than those of the traditional classroom group ($t = 6.24$, $df = 20$). Chute, Bruning, and Hulick (1984) suggested that students learned from the TT mode as well, if not better, than they did from the FF mode.

Acceptance

5.20 A related issue to how well students learn in a teletraining mode concerns how well students accept the TT experience. Chute, Bruning and Hulick (1984) examined the perceptions of internal students asked to compare the effectiveness of TT with the effectiveness of face-to-face instruction. Surveys were obtained over a six month period from 329 students enrolled in 45 face-to-face classes and 590 students enrolled in 32 TT classes. Students from each group were asked to respond to questions that pertained to course relevance and design, and to the overall quality of instruction.

5.21 Significance tests for large-sample means used to analyze the data indicated that no significant differences ($p \leq .05$) were found between the responses of the two groups on the response categories. This suggested that students perceived courses delivered via TT and traditional, face-to-face modes as being equally effective.

5.22 This finding was supported more recently by Youngblood, Tanner, Poston and Chute (1987) who assessed how clients responded to newly developed courses and to teletraining in general. The researchers reported a high level of acceptance and student satisfaction with the teletraining mode of delivery (i.e. 90%), and a high level of satisfaction with the content of each course.

5.23 In addition, they reported that student satisfaction was related to: (1) whether the content was relevant to their jobs and challenging enough for their level of expertise, (2) whether the cost for teletrained courses was less than the cost for face-to-face courses, (3) whether the transmitted visuals were of broadcast quality, and (4) whether the courses were interaction-oriented. They also found that clients thought short teletraining sessions (i.e. one-half to one-full day) conducted in full-motion video, at a site near their office were very appealing.

Appeal

5.30 Related to instructional effectiveness and learner acceptance is the concept of instructional appeal. While traditional attempts to improve training tend to focus on effectiveness, efficiency and affordability as the critical areas of high-quality training, these according to Wedman & Graham (1988) are not sufficient enough to insure that the training will be well-received, or that the trainees will return in the future. In other words, "better--faster--cheaper is not good enough" (Wedman & Graham, 1988).

5.31 Instead, they suggest that a fourth factor - "appeal" should be considered, especially in a business environment where training success is, in part, due to how much satisfaction the client anticipates from the experience. While there seems to be little doubt that teletraining can provide effective, efficient and affordable alternatives to face-to-face training, there continues to be some "learner" resistance to teletrained instruction (Wedman & Graham, 1988).

5.32 The researchers argued that the factors related to the appeal of training and training delivery should be identified and addressed so the receptivity of TT instruction can be increased. In order to identify these factors, Wedman and Graham examined the appeal three modes of instruction - audiographics, full-motion video (1-way video, 2-way audio), and face-to-face training.

5.33 Results based on observational, questionnaire and interview data suggests that teletraining can be made more appealing by focusing attention on the instructional elements, the social needs, and the innovation-adoption aspects of TT.

5.34 Specific strategies to improve the appeal of teletraining are recommended. By implementing these strategies into the design and delivery of teletrained instruction the NTC increases the level of gratification that learners experience in teletraining.

Expectations

5.40 In other studies Wangenmann (1986) examined students' concerns, experiences, expectations, and feelings in a day-and-a-half long teletrained course using naturalistic inquiry. Wangenmann found that, (1) what students experience in teletraining is influenced by their prior needs and expectations, (2) among their major concerns is the feasibility of TT applications within their organizations and the cost of both equipment and services, (3) students believe the on-site coordinator is critical to the success of a course, and that (4) proper instruction and guided practice are essential to removing the "myth and magic" from TT. Wangenmann suggested that instructors should maintain an awareness and sensitivity to the concerns of students so as to better meet their needs.

Attributions

5.50 Along similar lines, Murphy (1987), conducted a study to determine to what extent learners in teletraining attribute their success or failure to the instructional medium and to the learning environment. The results showed that students attributed mood, effort, ability, attitude, a need to do well, the quality of materials, the instructor, and the design of instruction, to their ability to learn successfully in a teletraining environment. Murphy discusses cross cultural implications for the design of teletraining for international audiences.

COST-BENEFIT ANALYSES

Cost-Avoidance

6.00 Teletraining (TT) has produced significant cost-benefits for AT&T over the past several years. Major savings were realized through the teletraining of internal courses, one-hour update programs and special internal seminars (Chute, Hulick & Palmer; 1987). In effect, the costs previously incurred from travel expenses and lost productivity were avoided by using the TT medium. The research conducted in this area provided evidence that TT is a cost-effective alternative to face-to-face information delivery.

Cost-Comparison

6.10 Besides conducting cost-benefit analyses on the TT medium in general, NTC researchers were interested in how well TT faired cost-wise, when compared to other instructional delivery modes. Chute and Hulick (1987), reported an AT&T study comparing six instructional modes of delivery; (1) face-to-face (FF), (2) programmed instruction (PI), (3) computer-based instruction (CBI), (4) audio teletraining (AU), (5) audiographic teletraining (AG), and (6) video broadcast systems (VBS). A projected audience of 2200 clients in 1988 was used in the computation. Based on the Lotus-model revenue projections, the two most cost-effective modes of delivery were audio and audiographic teletraining.

Cost-Efficiency Model

6.20 Since the cost of delivering instruction is an important consideration in many training programs, the NTC staff has recently developed a cost-efficiency model that can assist clients in selecting a medium or media suited to their budgets and needs. The Lotus-spreadsheet model developed by Lewis, Bishop, and Wangenmann (1987), incorporates charts, figures and formulae based on industry-accepted values or other values determined by experts in the field of instructional technology. Figures provided by the client are evaluated on two levels of detail. The macro level compares the basic costs of implementing six delivery options (i.e. face-to-face (FF), programmed instruction (PI), computer-based education (CBE), audio teleconferencing (AU), audiographic personal-computer conferencing (AG), and full-motion video (V)). Included are the annual cost figures for equipment, maintenance/updating, trainees, instructors, support staff, and delivery of instruction.

6.21 On the micro level, a higher level of detail is shown that reveals each individual cost factor, the formulae used to derive the cost figures, and the actual dollar amounts used in the computations.

6.22 To demonstrate the effectiveness of the model a hypothetical situation was developed in which 2000 people were expected to receive 8 hours of training within a 1-year period. By incorporating various details and figures of the particular training situation, a total cost figure was computed and the most cost-efficient method of instruction was identified.

6.23 The results indicated that all technologies listed above were more cost-efficient than FF delivery. It was concluded that if an analysis proceeds only to the point where the initial cost of the equipment and course development is determined, then any form of instruction delivered by advanced technologies would naturally appear to cost more. However, by factoring in cost-savings figures it can be shown that the actual cost of instruction utilizing advanced-delivery technologies is lower than the FF mode.

6.24 This and other cost-benefit studies conducted by the NTC provided evidence that TT is an economical alternative to face-to-face information delivery.

COURSE AND CURRICULUM DEVELOPMENT

Survey of Curricula

7.00 While many of today's corporate managers are faced with the responsibility of training a widely dispersed work force, a large number are not acquainted with the distance education technologies available today nor are they familiar with the skills and knowledge required to put the technology to use.

7.01 In an attempt to determine what programs were available to professionals needing training in distance education, Goldberg (1988), studied a dozen leading universities and corporations to assemble a profile of what was currently being offered around the country.

7.02 Goldberg found that in general: (1) universities offered "skills" courses in instructional technology (IT) while corporations did not, (2) from a project-management and system-integration perspective, both universities and corporations offered courses in instructional telecommunication systems (ITS), (3) general computer-based education (CBE) courses were offered at some universities while select CBE courses were offered at both universities and corporations, (4) overall, very few CBE and ITS courses were conducted from a design & delivery perspective, and (5) most IT courses surveyed were oriented toward the middle ground between hi-tech and low-tech and between a "skills" emphasis and a "management" emphasis.

7.03 In conclusion, Goldberg (1988) said that there were no programs (i.e. academic or corporate) around the country specifically oriented toward TT in a corporate environment, and that professionals had to obtain most of their knowledge & skills through on-the-job-training, or from seminars and private consultants.

Components of a TT Curriculum

7.10 In a follow-up study Balthazar (1988) analyzed the responses of 30 business professionals located nationwide to determine what types of skills, knowledge, and media are needed in their TT applications. From these results NTC managers began to define the specifications for a complete TT curriculum.

Components of a Successful TT Course

7.20 In conjunction with the Goldberg (1988) & Balthazar (1988) studies, Youngblood, Tanner, Poston, and Chute (1987) identified several factors that were critical to the success of teletrained courses. Based on observation, interviews, and surveys from five different teletrained courses, the researchers identified several areas of critical importance. These areas concerned: (1) client characteristics, (2) course design-development considerations, (3) instructor presentation skills, (4) media limitations, and (5) on-site coordination activities.

7.21 Within these areas the authors presented over 37 detailed recommendations to guide the development of future teletraining courses and to outline critical areas needing further investigation. This study when combined with the results on the appeal of teletraining (Wedman & Graham, 1988) helped to further refine the process by which courses are designed and delivered for distant students.

Design and Delivery Workshop

7.30 To help familiarize clients with various teletraining media and assist them in acquiring basic skills required to put these to use, the NTC created a 2-day workshop called, "Teletraining Design and Delivery." The workshop authors, Chute, Mercer and Mikell (1984), geared their presentation to first time users who needed to come up to speed in a relatively short time.

7.31 Students receive their instruction entirely through an audiographic medium with the aid of a supplemental workbook and take turns in handling the various input media (e.g. graphics tablet and keyboard) and the speaker-phone system.

Over the 2-day period students step through several modules that describe how to design, present, administrate and evaluate teletrained instruction.

Client Support

7.40 In addition to finding out what clients want in a TT course or curriculum, the NTC seeks to find out what clients think about the quality of the support service they receive from the NTC. Boyd, Chute, Hulick, and Wangenmann (1986), looked into this and found that, (1) client satisfaction with the NTC was uniformly high, and that (2) NTC support was timely and productive. In general, clients believed the NTC was effective in supporting all aspects of their teletraining needs.

Conceptual Framework

7.50 In an attempt to describe how various innovative communications technologies can impact the teaching-learning process, Chute and Hancock (1985) developed the Instructional Communications Model. The model is similar to the AT&T Bell Labs communication model developed by Shannon and Weaver in 1949. The model consists of the following components: source, message, destination, communications channel, and the available instructional technology to make the communications channel most time-efficient and cost-effective.

7.51 The available instructional technology is factored down into five basic media elements, voice, print, graphics, video and computer. Combinations of these five basic elements results in a matrix of hybrid technologies of varying sophistication. For example, computer plus video is interactive video and voice plus graphics is audiographics.

7.52 Chute and Hancock plotted the pure and hybrid technologies on a continuum that ranged from a voice-only system to knowledge-based systems and artificial intelligence. The typology can be used to match the requirements of the training task with all appropriate technologies depending on the level of sophistication, cost, and outcomes desired.

Content

7.60 Researchers at the NTC have also investigated how current and often conflicting theories in psychology can be reconciled to provide general guidelines for curriculum development and course delivery strategies. In an early study, Chute (1984), examined major psychological theories that underlie modern, industrial-sales techniques, then suggested how aspects of each can help to answer the question, "What behavioral approach should a salesperson employ to be successful at AT&T?"

7.61 The review based on an extensive search into research journals, books, and periodical literature, provided concepts that were incorporated into the final recommendations for a modularized sales curriculum implemented shortly thereafter. The curriculum recommendation called for the use of flexible, electronic training systems such as teletraining and computer-based instruction to disseminate current information nationwide.

Evaluation

7.70 One evaluation study conducted by Harper, Chute, and Dow (1984) had these two purposes in mind; (1) to identify the strengths and limitations of the existing sales training program, and (2) to restructure the program so that it was not only content-focused but also reflected the needs of the current sales force. Over a one-month period 46 account executives (AE) from five sales regions across the county were interviewed.

7.71 The study suggested six ways to modify existing sales training courses. A key recommendation was to design a competency-based sales curriculum built on a detailed sales-skill matrix that can be used to facilitate the development of new employees. This study represented an innovative attempt to merge the psychology of sales behavior with the practical, everyday concerns of field-sales personnel in order to improve the effectiveness of an established curriculum. It also provided field-sales personnel with an opportunity to relate what they wanted as options in the technology used to deliver course information.

Instructor Competencies

8.00 AT&T has a strong interest in maintaining a high level of instructor effectiveness in its training programs. However, as can be expected instructors can differ widely in the way each approaches similar instructional tasks. To identify the common attributes that expert teachers share, Menendez, Kirkhorn, Law, and Chute (1983), conducted an analysis of top AT&T instructors and were able to develop a competency-based model that provided a basis for instructor selection, evaluation, career management, assignment and training. Expert instructors were found to possess skills or knowledge in these areas:

1. basic learning theory
2. organizing/managing materials & learning environment
3. managing course structure and organization
4. administration/evaluation
5. verbal & nonverbal presentation methods
6. responding to trainees
7. questioning techniques
8. coordinating group activities
9. subject matter expertise
10. teaming
11. teletraining skills

8.01 Chute and Sprouce (1984) validated the model with responses obtained from 57 managers, instructors, and instructional technologists. AT&T has since implemented a 6-9 month, instructor-certification program (ICP) that teaches people how to perform more effectively as instructors. The program is geared to refine instructors' skills periodically over 36 month period.

Teletrainer Competencies

8.10 More recently, Ahmad, Kester, and Poston (1988) developed a teletraining-competency model that identified two main categories and six subcategories of skills related to competent teletraining performance. In general, the model prescribes that instructors should be competent in the use of evaluation & management techniques, objectives, activities, and media.

MEDIA ATTRIBUTES AND SYSTEM IMPLEMENTATION

9.00 Applied research is generally geared toward finding cost-effective solutions to practical problems. When highly sophisticated technologies such as TT are developed, NTC researchers investigate ways that clients can get maximum use out of their investments. One of NTC's objectives is to generate information that will get technology up and running as quickly and as smoothly as possible. Various projects were directed toward these ends.

Audiographics: Ten Critical Features

9.10 Audiographics (AG) is the state-of-the-art technology that lies at the heart of the TT system. To identify what features users of AG systems want in an ideal system, Chute and Boyd (1986) surveyed a number of AT&T instructors and technologists for their responses. From the survey results emerged 10 critical features. These included for example, a desire for high-quality audio, hi-resolution imagery, an annotation capability, and a key-pad response capability.

9.11 Chute and Boyd (1986) suggested that future AG designs should incorporate these features to make the devices easier to operate and to improve the system's overall effectiveness.

Audiographics: 14 Critical Functions

9.20 Along similar lines, NTC researchers were also interested in identifying which audiographic control functions teletrainers considered critical to their on-line teaching success. Balthazar (1987) in a study with 12 expert teletrainers identified fourteen (14) such functions from a list of 24 and ranked them in order of importance.

9.21 These findings were further supported by written responses to the instruction, "List 5 of the most critical features you would require as keys on an audiographic peripheral device". The nominations for various functions were tallied then ranked in order of magnitude. A correlation coefficient was computed between these and the 14 items mentioned above. The results indicated a strong, positive relationship between the two rankings ($r = .86$).

9.22 In terms of psychological characteristics Balthazar (1987) found that the respondents' collective views about audiographic interfaces suggested guidelines for future audiographic designs. For example, respondents indicated that only a handful of functions were necessary in order to make them comfortable with instructing on-line but that these handful were critical to their teletraining success.

9.23 In addition respondents said they preferred functions that facilitated quick and simple screen control over functions that were more elaborate but cumbersome to use. In general, Balthazar concluded that when on-line, instructors wanted an interface that helped reduce the "already" complex nature of teletraining rather than contribute to it.

Student Response Systems

9.30 Another area of great interest in TT research concerns how to improve the feedback capability of students situated in remote locations. Yao and Carmichael (1988) studied the feasibility of student response systems in a TT environment and determined such devices will increase learner engagement. Their needs analysis led to the product specifications for the AT&T Advanced Learning System student keypad.

System Implementation

9.40 Another area of concern to NTC researchers has been how to introduce sophisticated TT technology into a client's organization without adversely affecting the social environment.

9.41 Chute (1984b), suggested that efforts to introduce change should be facilitated by three things: (1) knowledge of client's training needs and how these needs are being addressed in the client's current training environment, (2) an understanding of how teletraining differs from other innovative training delivery strategies, and (3) an awareness of the educational and psychological factors that affect the implementation of a teletraining system.

9.42 Knowledge of a client's training needs is typically acquired by conducting front-end analyses that help to pinpoint where problems exist. Both the client and the change agent have an interest in knowing where to focus their efforts.

9.43 An understanding how TT differs from other delivery strategies will facilitate implementation because training problems can be matched with cost-effective solutions. Clients who select TT must be made aware of specific attributes that make TT a worthwhile investment. Timely training, reduction of travel costs, increased productivity, are among the considerations that should be addressed. Most of all, clients should be convinced of teletraining's effectiveness as an instructional medium.

9.44 Implementing an innovation should not be an entirely prescriptive process. Rather, the client and the change agent should collaborate on how the implementation is to take place. Mutual involvement will help the client overcome a natural resistance to attempt something innovative. To assist this process the change agent can employ a conceptual tool to keep track of the client's various psychological concerns. The concerns-based adoption model (CBAM by Gene Hall, 1979) which is used for this purpose describes seven stages that clients typically go through: (1) the awareness stage, (2) the informational stage, (3) the personal stage, (4) the management stage, (5) the consequences stage, (6) the collaboration stage, and (7) the refocusing stage.

9.45 With a grasp of this concept the change agent can assist and guide the client through every phase of the transition. Thus, the model serves as a useful diagnostic tool to help identify where more focused effort is needed during the implementation process.

9.46 The studies presented here have described how user-oriented information has been useful to AT&T. This category of research provides the kind of information that keeps TT a viable alternative to other delivery modes.

FUTURE RESEARCH DIRECTIONS

10.00 Today, educators and corporate trainers are faced with the challenge of providing quality educational programs for an ever-increasing number of students who are globally-dispersed. The information age and the high rate of technological change has opened new job opportunities for millions. There is a need for more training and retraining to prepare people for the work place (Poston, 1988).

10.01 One potential solution is to develop a student-centered, technology-based, information management and dissemination system (IMDS) that will provide users with the ability to access automated, educational data bases. To bring IMDS to fruition, a joint venture between AT&T, Indiana University, and other leading institutions has been arranged to provide the needed research behind the technology.

IMDS Project

10.10 What is needed today is a technology that is easy to use, easy to support, and easy to manage. IMDS strategy is a step in that direction (Hancock and Chute, 1987). The information system should make available, on-line databases backed by support and documentation, that can be accessed through personal computers and terminals with natural-language queries and commands. In addition, the system should be able to tell what training programs are available through CBT, TT videodisc, or lecture, and should also be able to list course schedules, instructors, and training locations when necessary.

10.11 Such a system should also have the capability to assist users in narrowing or broadening the search for information and should have the capability to monitor user-patterns (e.g. number of times help was needed during a session). Knowing how users interact with the system will be helpful in future course development, expert systems development, and the development of other pertinent information resources.

10.12 The partnership between AT&T and academe offers educational researchers a unique opportunity to engage in programmatic research to improve the effectiveness and efficiency of technology-based learning systems. The research studies sponsored by the partnership are programmatic in the sense that, over a period of years, the individual studies will weave a fabric of sound instructional research on which the development of sophisticated learning systems can be based. The findings of each study will be tied to the development of an integrated, instructional-communications model (Chute and Hancock, 1985).

Proposed Research Projects

10.20 Research projects need to be conducted that will answer critical questions for the development of the IMDS strategy. The following research projects have been identified as important topics for successful development and implementation of IMDS.

(1) Natural Language/Artificial Intelligence
(2) Adaptive Learning Strategies
(3) Adaptive Testing Strategies
(4) Message Design Attributes for Emerging Technologies
(5) Student Motivation Enhancement
(6) Training Effectiveness Models

10.21 Several of these projects have already begun and various teams have been collaborating on the planning and execution of the much needed research.

Dissemination Strategy

10.30 The overall plan calls for the findings from the research to be disseminated through a variety of technology-based systems. Initially, a teletraining network will be used to share ideas and information among faculty from academic institutions and AT&T organizations.

10.31 Later, information modules will be developed for the stand alone, Integrated Learning System for the Future (ILSF), which is currently in the initial stages of development. The ILSF will integrate computer-based training, digital imagery, laser disk, and teletraining into one system driven by an AT&T personal computer.

10.32 The IMDS project represents one of the most ambitious ventures undertaken to develop a networked system of information that will propel distance education into a new level of excellence by the year 2000.

10.33 Additional research is required in a number of other areas to further refine the teletraining application and to keep pace with technological developments that enhance the capabilities of interaction in a teletraining system. The promise of a "systemic" approach to instructional design, delivery, and evaluation offers an interesting direction when contrasted with the more traditional "systematic" models currently being used in corporate training environments.

10.34 The National Teletraining Center will continue to expand its effort in a variety of research areas in an attempt to understand more clearly the types of problems and benefits that are involved in teletraining applications.

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